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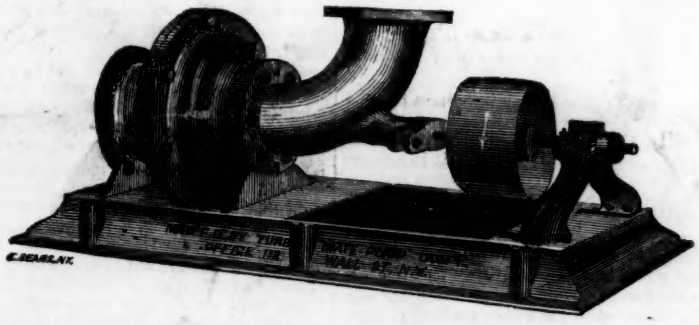
The Turbinate Centrifugal Pump.

Among the many varieties of pumps which have been successfully introduced within the last few years, that represented in the annexed engraving possesses decided advantages over all others for many purposes as for instance, for use in steamships for bilge pumps and supplying surface-condensers; draining and irrigating lands, water works, dry docks, railway stations, for distillers, brewers, tanners, and sugar plantations, also for wrecking purposes, and similar operations.

The construction of the apparatus, which is very simple, will be readily understood by reference to the cuts, in which Fig. 1 is a perspective view, showing the pump arranged horizontally. Fig. 2 is a section showing the same in a vertical position, and Figs. 3, 4, and 5 are detached views representing respectively the top of the wheel-case, an inverted plan of the wheel itself, and plan of the chamber of the apparatus. The horizontal pumps are furnished with suitable bed-plates, as shown in Fig. 1, their internal construction being the same as in the vertical ones, which may be briefly described in detail as follows:



THE TURBINATE CENTRIFUGAL PUMP.

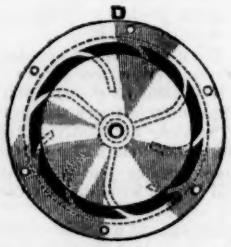


Fig. 3.

Fig. 4.

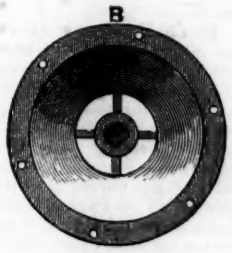


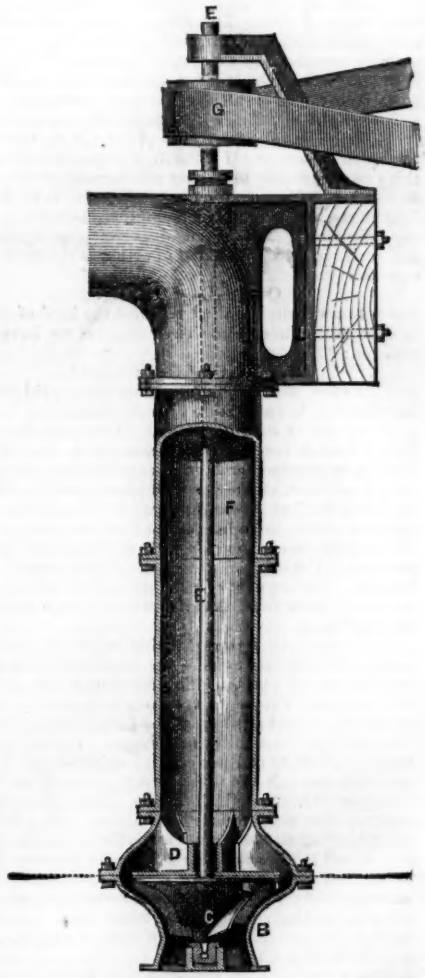
Fig. 5.

B is the wheel-case in one piece, with openings either in bottom or sides for the admittance of water. In the center of the base is the hub, cast with, and connected by, arms to the case for the reception of the step or bearing. C is the turbinate wheel secured to a shaft, E, having vanes or paddles of different lengths at its curved periphery, which are bent at their discharge ends, closely fitting the space between it and the case, B, within which it revolves without touching. In the end of the wheel is the anti-friction pin (used in the vertical pumps only), which revolves in the female step secured in the hub of case, B. D is the upper chamber with its anti-friction partitions divided into three compartments, each of which is subdivided and connected with the bottom plate which withholds the weight of water from the wheel, C. F is a discharge-pipe, made in different lengths according to the hight required to raise the water. At the top is the stuffing-box, through which passes the driving-shaft, E. Above the box is the pulley, G, fastened. The end of the shaft, E, is supported by a brace fastened to the plate of the elbow.

In the operation of the wheel the water is caught up by the vanes or paddles of the wheel, C, near the center of its base, the centrifugal force sending it rotating to the narrow space in case, B, and so into the openings of the upper chamber, D, where the rotation is checked and given a vertical direction only. The only parts having motion are the wheel and shaft. Motion is applied to the shaft by belt or gearing, as may be thought desirable.

It is claimed that these pumps will discharge more water at any given hight with less power than any other pump in use; that they save power, being almost frictionless compared with other pumps; that their simple construction and arrangement renders them more durable and perfectly reliable at all times; that their great capacity makes them particularly desirable for steamships and sailing vessels in cases of leaks from collision or other accidents at sea; and that they are equally applicable to purposes of irrigation, drainage, and the multifarious operations for which pumping mechanism is generally required. It should be mentioned in this connection that these pumps are used for supplying the surface condensers on some of the largest steamships sailing from the ports of New York and Boston, including the Pacific Mail steamers.

Fig. 2.



This pump was patented by J. H. A. Gericke, May 29th, 1866, and all sizes, varying in capacity from 150 to 50,000 gallons per minute are being manufactured by the Turbinate Pump Company.

Office, 85 Liberty street, New York City, where a small one may be seen in operation, discharging 450 gallons per minute. They are sold 25 per cent less than any other pump of equal capacity.

Circular furnished on application.

On Some of the Constituents of Coal Gas

A Lecture by Dr. ODLING, F.R.S., F.C.S., etc., before the British Association of Gas Managers.

[From the Journal of Gas Lighting.]
(Continued from p. 67 of the American Gas-Light Journal.)

Now, a word or two with regard to another constituent of coal gas—viz., carbonic oxide. Carbonic oxide exists in ordinary coal gas to a comparatively small extent, the proportion varying from 5 to about 15 per cent. This gas is characterized by its burning with a feebly luminous but decidedly blue flame. I have here some of it in a holder, and you see the clear blue flame by which its combustion is characterized. We will now substitute for the glass tube an ordinary burner; but though I am using the largest sized bat's-wing, I am able to get but a very small flame, carbonic oxide being a gas which is very soon burned out. Now, although carbonic oxide exists to the extent of from 5 to 15 per cent. in ordinary coal gas, it exists in a much larger percentage in the gas that is produced by passing steam over ignited coke. You will remember that at one time there was a project for making illuminating gas by means of steam passed over coke. The gas so produced has itself no illuminating power, but we may give it an illuminating power by burning with it some luminiferous hydrocarbon, such as benzol, or by introducing into its flame a coil of platinum wire. Here we have a U-tube containing pumice and benzol, and we will now pass through it some of this carbonic oxide gas. You will see that it is a very excellent purveyor of the hydrocarbon, and that thus we get a very luminous flame, because carbonic oxide is the gas which, for an equal quantity of oxygen, gives out by its combustion the largest proportion of heat—larger even than hydrogen—in the proportion of 68 to 57. The other mode of giving illuminating power to the originally non-luminous flame, and which seems to some extent a considerable success, is by means of a coil of platinum wire. On holding this piece of wire in the flame it becomes of almost dazzling whiteness, and radiates light abundantly. I remember once seeing a room of the Royal Society illuminated in this manner for a few hours, and I think it is a question whether this steam gas may not, after all, be made something of. When steam passes over coke, the coke being heated merely to dull redness, there is scarcely any carbonic oxide gas produced—it is nearly all hydrogen and carbonic acid. The kind of action is shown in this equation:

$$C + 2H_2O = CO_2 + H_2.$$

But when we employ a full red heat the kind of action is different. Under those circumstances we have this reaction:

$$C_2 + 3H_2O = CO_2 + CO + H6.$$

So that after the removal of the carbonic acid gas by lime there is left a mixture of three volumes of hydrogen with one of carbonic oxide. There is a great prejudice against the use of carbonic oxide, from its extremely poisonous character. An atmosphere containing only 2 per cent. of the gas will prove fatal to animals breathing it; but inasmuch as gas for illuminating purposes is meant to be burned, and not to be breathed, the question is not so much with regard to the poisonousness of the original gas as of the products of combustion. The amount of gas that escapes into the air unburned is so small that its presence may safely be disregarded.

Just one or two remarks with regard to carbonic acid. Carbonic acid gas is incombustible, and it has the property of extinguishing flame in a very remarkable degree. Further, a very small proportion of carbonic acid in coal gas lowers the illuminating power of the coal-gas flame to a great extent. It is estimated that the presence of 1 per cent. of carbonic acid in coal gas will diminish the illuminating power of the flame by 5 per cent. Now, this is a very curious observation, and requires some further explanation, which I think the following circumstances may afford: Carbonic acid gas at a high temperature undergoes decomposition. In the interior of any flame, carbonic acid ceases to be carbonic acid; it is decomposed into carbonic oxide and oxygen, so that in this way 2 per cent. of carbonic acid gas is equivalent to 1 per cent. of oxygen—or it may be said that 2 per cent. of carbonic acid is equivalent to 5 per cent. of air—and you know that an admixture of 5 per cent. of air will lower the illuminating power of gas very much. In this case, a combustion takes place partially in the interior of the flame instead of at the surface only; and by this interior combustion the luminosity of the flame is interfered with, in accordance with well-known principles. In order to obtain the maximum of luminosity, then, the admixture of oxygen in the form of air or of carbonic acid with the coal gas should be as little as possible. Where coal gas issues under a strong pressure, it gets mixed up with air to such an extent that the flame is scarcely more luminous than that of a Bunsen burner; and, from the decomposition of carbonic acid gas into carbonic oxide and oxygen, the carbonic acid contained in coal gas interferes with the luminosity of the flame in the same way as would an admixture of air.

Carbonic acid may be further considered, not only as a constituent of coal gas but also as a product of its combustion. That it is produced by the combustion of coal gas we may readily ascertain. If we pour a little lime water into a flask within which a jet of coal gas has been allowed to burn for a short time, the lime becomes converted into chalk, by its absorption of the produced carbonic acid, and we get at once a milky precipitate as you perceive. But carbonic acid gas is produced not merely by combustion, but also by respiration. If I breathe into this bottle, already containing a little lime water, you see that I get at once a deposit of chalk or carbonate of calcium, just as in the last experiment of the burning gas-jet. Here a point of interest obviously arises in the consideration of the relative proportions of carbonic acid discharged into the atmosphere by the combustion of gas and the respiration of individuals. Time will not allow me to enter upon statistical details, but, speaking roughly, I may say that the air expired from the lungs contains between 3 and 4 per cent. of carbonic acid, and it is calculated that one man in an hour produces as much carbonic acid gas as a burner consuming 6 feet of coal gas, or as two burners consuming 3 feet each. So that when it is objected that any two burners in a room are producing so much carbonic acid as to affect the atmosphere injuriously, you may turn out your neighbor or turn out the gas with equal relief, seeing that he contributes quite as much carbonic acid as the couple of burners. Now, the ordinary proportion of carbonic acid gas in the atmosphere is under a half part in a thousand—it is about ·04 per cent. The maximum amount that has been found in the gallery of a crowded theatre for instance, where it may be assumed that the atmosphere is defiled to its utmost possible extent both by the combustion of gas and the respiration of individuals—each individual contributing as much as is produced by 6 feet of gas—has always fallen short of a half per cent., the highest determination made by Dr. Roscoe amounting to ·32. Apparently when the carbonic acid begins to accumulate to this extent, ventilation takes place through crevices and porous walls (for walls are freely porous to the minute particles of gases) whereby the proportion of carbonic acid is kept down, and, as I have just said, it has never been known to reach one-half per cent.

Now this observation has a very important bearing upon some other facts, to which I will refer in a minute or two; but there is, first, one other remark I have to make with regard to carbonic acid gas. It is a liquefiable gas. Under exposure to high pressure and low temperature it is converted into a transparent liquid; and, in its liquid state, it presents a most remarkable resemblance in its properties to that terror of gas managers, disulphide of carbon. Liquefied carbonic acid gas (CO_2) and disulphide of carbon (CS_2) are both of them heavier than and immiscible with water, but miscible with alcohol and ether; and they are both of them excellent solvents for fats, resins, india rubber etc. Further, in considering the properties of disulphide of carbon, we shall find that it acts as an anhydrous acid, combining directly with bases to form definite salts, strictly comparable with the ordinary carbonates produced by the direct combination of carbonic acid with bases.

Disulphide of carbon is a compound of great chemical interest, and I will now endeavor to illustrate to you some of its most striking properties. In the first place, it is a readily combustible substance—its carbon burning into carbonic acid gas, CO_2, and its sulphur into sulphurous acid gas, SO_2; but when burned with a deficient supply of air, a good deal of its sulphur escapes combustion, and separates as a deposit of yellow smoke. By warming a little disulphide of carbon in this flask I get an abundant supply of the vapor, which you now see burning with a fine blue flame, not unlike that of carbonic oxide. The flame is of a very considerable brilliancy; and a piece of iron wire or watch-spring burns readily in it, with vivid scintillations and formations of sulphide of iron. Here, then, we have an illustration of the inflammability of disulphide of carbon in the state of vapor; and before calling your attention to the facility with which it assumes the state of vapor, I will just refer to the brilliancy of its combustion, both in oxygen and in the gas known as nitric oxide. With oxygen, however, the experiment is a dangerous one, from the violence of the explosion. In this jar of nitric oxide gas, then, I introduce a small quantity of disulphide of carbon, and, after shaking up the jar, apply a light to its mouth, when you will observe a large descending body of flame of surpassing intensity. This flame is very rich in chemical rays, and although lasting for scarcely an instant, is nevertheless applicable to the purposes of photography, as a substitute for daylight. I will next give you an illustration of the facility with which the disulphide vaporizes. At one end of this long shallow tray I place a piece of sponge wetted with disulphide of carbon. I now bring a lighted taper to the other end of the tray, at a distance of 3 or 4 feet from the sponge, and you observe that the vapor with which the tray is filled immediately takes fire; and I thus set fire to the sponge at a distance from it of several feet. The vapor of disulphide of carbon is very heavy—nearly three times as heavy as air. I have here a bottle of disulphide of carbon vapor, and here a succession of empty glasses. I pour the vapor from the bottle into a glass, from the first glass into a second, from the second into a third, and from the third into a fourth, and you see that in that fourth glass there is sufficient disulphide of carbon vapor left to take fire upon my bringing a light to it. The extremely low inflaming point of disulphide of carbon vapor is another point of much interest. I have here a little olive oil in a test-tube, which I heat over a lamp to the temperature of about 400°, although a lower temperature would suffice; and when I bring the extremity of the tube of hot oil near to the disulphide of carbon in this glass, you observe that it acts like a lighted match, and immediately inflames the vapor of the disulphide.

(To be concluded in our next.)

The Source of Light in Flame.

It has until recently been taught that the light of flames is altogether due to the ignited particles of solid matter liberated in the burning gases. Recent experiments, however, have proved that this is not true in all cases. In burning hydrocarbons—whether a candle or hydrocarbon oils—the oxygen of the atmosphere first unites with the hydrogen, by reason of its greater affinity for that gas than for carbon. If there is not an excess of oxygen present, the particles of carbon will be set free and pass off as smoke, or be deposited in the form of lampblack. The union of the oxygen and hydrogen is made without any material production of light or flame. The flame and light is due to the burning particles of solid carbon which vibrate, momentarily, with the evolution of waves of light, and are then consumed or converted into a invisible gas. If we hold a piece of white crockery in a hydrocarbon flame, it is immediately blackened by a deposit of carbon, which is cooled by the contact, and arrested in its progress of consumption. If we hold a piece of the same crockery in an oxyhydrogen flame it will not be blackened, for the reason that there is no carbon present.

When an electric light is projected upon a screen, it is distinctly noticeable that the brightness of the light is produced by the two ignited solid carbon points, while the space between them is almost dark—the little light that is visible is due to the passing over of fine particles of the carbon from the positive to the negative pole.

But all flames are not thus due to the ignition of particles of solid carbon or other solid matter. It has recently been shown that compression has much to do with the production of flame. Oxygen and hydrogen contain no solid matter, and hence it has been supposed that the flame produced by their combustion could not be made to give out light. Recent experiments, however, have shown that when these substances are ignited by an electric spark, in a very strong vessel, they give out a most intense light. This light is due to the compression produced by the expansion of the gases at the moment of ignition.

The brightness of the electric spark may be largely increased by compression of the atmosphere through which it is passed. If we attach a glass tube to a force pump, and produce the electric spark within it, while the density of the air is being constantly increased by the action of the pump, the luminosity of the spark will increase with the increasing density of the atmosphere in the tube, and fall off with the decrease of its density.

Various other experiments of a similar nature have recently been made to prove that the rule which influences the production of light in flames, without the presence of solid particles is—that the denser the products of combustion, the greater is the light produced. —*Scientific Press.*

—Professor Botger, inquiring into the cause of the action of distilled water on lead, has found it to be due to the presence of carbonate of ammonia, and not, as is usually ascribed, to the air dissolved in the water. After having been boiled for a time, distilled water will not attack the lead until after a considerable exposure, when a reabsorption of ammonia and carbonic acid from the air, where they are always present, may be supposed to have taken place. Botger has further found that the alloying of the lead with a small amount of tin protects the former from being acted upon, and this fact suggests the advantage of purposely introducing a little tin into the metal from which lead piping is to be manufactured.

On the Distillation of Hydrocarbons.

By Joseph Hirsh, Ph.D.

On reading the note of Prof. B. Silliman, on his "Examination of some California tar," it occurred to me that similar experiments, when carried on with a view of ascertaining the qualitative and quantitative result of illuminating oil, should be executed under circumstances more parallel to the distillation on a large scale, in order to arrive at an approximately true result.

During distillation of natural hydrocarbons on a commercial scale, that is, in large stills, the process of "cracking" always takes place to some degree; or, in other words, as all native hydrocarbons consist of mixtures of those substances of greatly varying boiling points, all hydrocarbons of high boiling points contained in such mixtures are during distillation exposed to various degrees of temperature below their own boiling point, as long as those hydrocarbons of lesser gravity and lower boiling point have not been removed by distillation.

It is this exposure to a lower degree of heat than corresponds to the distilling point of an oil of definite gravity which comprises the operation of "cracking." If we consider that the stills used ordinarily in this country vary in capacity from 500 gallons to 20,000, and in single instances, as in the refinery of Reese and Graff, Pittsburgh, Pa., to 40,000 gallons a piece, the discharge of which varies in duration from one to six days, it will be evident that frequently, as in the last case mentioned, a portion of the oil, which may enter the still with a boiling point of, for instance, 400° F., will remain exposed for more than 100 hours to various degrees of increasing heat, all of which are below its own boiling point, as the heat of even the strongest fire is absorbed by the evaporation of the more volatile portions of hydrocarbons.

During this *normal* state of distillation in a still of such dimensions, the process of "cracking" will be taken advantage of in a supreme degree without any especial efforts or loss of time, the resulting distillate being of a light specific gravity and corresponding color, while only a small portion distils over as paraffin oil, the latter being due to over heating, which with a small quantity can hardly be avoided in so large a still, on account of the peculiar shape which has to be given to it to insure sufficient strength, and the effect upon that of the fire. To this point I shall return again.

If we compare the distillation of five or ten gallons with the above we find that in applying fire freely, the entire quantity may be distilled off in less than an hour, and cannot likely take more than a few hours—referring, as before, to a moderately intense heat. Here, according to the construction of the still or the manner of applying heat, the distillate will contain hydrocarbons of as high a specific gravity respectively, and as high a boiling point, as the crude oil did before entering the still, or even of a higher one, if the oily vapors were over heated.

In this case the two leading items in the distillation on a commercial scale, viz., time and a temperature below the actual boiling point of a portion of the oil, are entirely wanting, and their absence unavoidably greatly modifies the resulting product. If, then, we wish to distil a small quantity of hydrocarbons analogous to the manner in which this process is carried on on a large scale, we have to employ the process of "cracking" only. But even then very rarely has the time of executing such a distillation of a few gallons been extended beyond a small number of hours, and the consequence is a distillate with a comparatively high boiling point

The difference between this last named distillation and that on a large scale is the same as the one between distilling coal for the production of illuminating gas and that for producing coal oils. The former, producing tar of great specific gravity, is, for the reasons mentioned, even on a large scale, carried on in comparatively small low retorts, while for the production of coal oils, the larger revolving retorts are found more desirable. In these, the oily vapors are exposed to a cooler temperature than their own, with every revolution of the retort, and are in this manner broken up into oils of lighter gravity, distinguished from the tar oils by their fitness for illumination.

If, then, a few gallons of hydrocarbons are distilled with a view of presenting the probable results on a large scale, we ought to consider the amount of heating surface, which ought to be small, and only at the bottom of the still, together with the arrangements made for cooling the sides and upper portions of the distilling apparatus, as this materially influences the process of "cracking."

This may be more comprehensible by noticing the rules which by experience I found to regulate the distillation of carbon oils on an extensive scale.

1st. The difference of temperature between the actual boiling point of oil of definite gravity, and of the temperature to which it is raised, is proportionate to the effect of the process of "cracking," that is to say, the more the temperature of the actual boiling point of oil of definite gravity is above the temperature to which the same oil is raised, the greater is the quantity of light oil obtained. If then we wish to reduce the gravity of a very heavy oil greatly, we shall have to employ an exceedingly low temperature, so low sometimes as to suspend actual distillation for a short time.

2nd. The gravity of the distillate, resulting from reduction of temperature, will be directly proportionate to said reduction, *i.e.*, if we reduce the temperature to a degree at which only naphtha of 0·700 boils, the resulting distillate will possess a specific gravity of 0·700 regardless of the gravity of the original oil.

This law enabled us to produce a distillate of any desired gravity (below that of the oil before distillation) from any crude oil, and a due regard to it enables us to produce an illuminating oil of the same specific gravity without great quantitative loss from the light Pennsylvanian oils, as that produced from the heavier Ohio, Canada, or California oils. In distillation, the temperature therefore should always be reduced to the boiling point of oil of the specific gravity desired.

3rd. The difference between the temperature of the two boiling points, viz., of the oil being subjected to distillation, and of the desired distillate, is in direct proportion to the height of the still employed, or which produces the same effect, to the facility for cooling the upper portions of the still. According to this law a heavy oil will yield the readier a light distillate the higher its vapors have to rise before leaving the still, because the reduction of temperature in those higher portions of a retort which are more remote from the source of heat acts upon the vapor of the oil in fine division, and reduces their gravity more readily than the compact liquid oil.

If the heat is applied solely to the bottom of the still, while its sides and top may be exposed to a current of cool air, the reduction of the temperature of oil vapors takes place similarly to, and can be controlled better than, the cooling in high stills without this provision.

The arrangements for cooling the sides and top of a still must therefore be the more complete the lower or smaller the still employed is. This law also teaches us that stills to be used for "cracking" oil should have a flat bottom, and should have the flues arranged in such a manner as to permit the restriction of the fire to the bottom only, which is necessary to the process of "cracking."

Where superheated steam is used as the heating medium it ought to be applied at the bottom only. Where the dimensions of a still become as huge as was mentioned in the beginning of this article, a flat bottom hardly be strong enough; in this case the boiler shape is usually employed. In order to have a practically sufficiently large heating surface, the fire here has to reach up to a certain distance on the round boiler. If the quantity of oil present in the still is so small as to be below the boiler surface exposed to the fire, the raising oil vapors will be superheated on this surface, and the resulting distillate will be of greater specific gravity, and of darker color than it normally would have been, the product resembling more the oils resulting from the distillation of coal-tar.

For this reason the residuum in such stills, after reduction to the quantity mentioned, is frequently removed to smaller stills. This diminution of temperature of the oil vapors causes a partial condensation and redistillation of the oil, which diminishes the color and gravity of the oil.

4th. The intensity of the process of "cracking" is proportionate to the suddenness with which the oil vapors are condensed before leaving the still. The thorough application of this principle produces more rapidly those results mentioned as necessary in the preceding paragraph.

5th. The difference in gravity between that of the oil distilled and of the desired distillate is in direct proportion to the quantity of water produced in the process.

If from a very heavy oil an exceedingly light distillate is to be produced, the proportion of water is so immense as to show occasionally a distillate of water with but a minute percentage of oil floating on its surface. In all such cases small black particles of carbon float on the top of the water, forming an intermediate layer between the latter and the oil. The quantity of carbon separated in this manner is also proportionate to the quantity of water distilled over resp., to the intensity of the process of "cracking" employed. This carbon is mechanically carried over by particles of water, which in contact with oil always produce violent ebullition.

These laws are the same with hydrocarbons distilled under the ordinary atmospheric pressure as with those distilled in a vacuum under increased pressure. In the two last-named cases the variation of boiling point corresponding to these different degrees of pressure has to be taken into consideration.

Referring once more to the article of Prof. Silliman, I would mention that I deem his concluding assertion —"The transformation of light oils into denser products like tar, to result not as has been supposed by some, from the addition of oxygen producing an oxidized body, but by the removal of successive atoms of hydrogen in the form of water,"—simply a different mode of expressing the opinion of others referred to, as the removal of hydrogen in the shape of water is certainly a perfect and true process of oxidation.—*Chem. News.*

Erie Water Works.

The people of the thriving city of Erie, Pa., have been for years dependent for their supply of water on local wells, aided by an inefficient system of supply furnished by a limited and unreliable congeries of pipes fed by springs of small capacity. But it is soon to be supplied from the pure waters of Lake Erie, than which no better water for drinking, lavatory, or manufacturing purposes is in use. The plan, under the superintendence of H. P. M. Birkenbine, a well known Philadelphia engineer, is to erect on the shore of the lake an engine house and stand-pipe, the latter of sufficient hight to provide a head capable of supplying the most elevated portions of the city.

The *Erie Dispatch* says: "The stand-pipe rises 234 feet above the level of the water, and stands on a rock 14 feet high, making the pipe 220 feet high; it is five feet in diameter, and is made of boiler iron 3-16ths of an inch thick at the top and 7-16ths of an inch at the bottom; it weighs 42 tuns. This is to be surmounted by an ornamental spire of bright metal fifteen feet high. This is the highest pipe on the continent, and probably in the world. It was raised in a very novel manner, the invention of the contractor, and is well worthy of a patent. It was done very much as the Irishman proposed to build a chimney, 'hold one brick up and put another under it.' It was done by commencing with the top section and adding the lower sections in their regular succession, hoisting the pipe as each section was added, by means of derrick and pulleys.

'Around this pipe is to be built a tower nine feet six inches from wall to wall, and 190 feet high from the rock, surmounted by a balcony five feet wide. The balcony is reached by a spiral stairway of 250 steps. The stairway and pipe will fill the entire space in the tower. The tower will be of stone 22 feet, and the remainder of brick. The engines are of the Cornish pattern. Their cylinders are upright, and are 60 inches in diameter and 10 feet stroke. The cylinders themselves are of immense weight. The pistons work directly in connection with the pump rods. This connection is made in the lower or middle story. The pumps are in the basement story, placed directly under the engines. They are 2[illegible] inches in diameter and 10 feet stroke, and are capable of pumping 2,000,000 gallons each in 17 hours. Adjoining the engine house is the boiler house, which is 50 by 60 feet and one story high, made of brick. In this will be eight boilers, 30 feet long and 42 inches in diameter, with two 14-inch flues. They rest on brick and stone work, built up from the solid rock. Each boiler will be independent of the others, so the stopping of one will not affect the others. The fire will not be under the boilers, as is commonly the case, but will be in front of them, in combination chambers. The smoke stack is to be 100 feet high."—*Sci. Amer.*

Carbon in Iron.

It is well known that there are two states in which carbon exists in solid iron; a state of chemical combination with the iron, and a state of merely mechanical diffusion through its mass. It is also known that the carbon existing in iron in the last mentioned state is always in the form of graphite. Dr. Phipson has recently announced to the Academy of Sciences that he has discovered that silicium also may exist in cast iron either in a state of combination, or in a state of diffusion merely, and that, like carbon, when merely diffused through the iron, and not in combination therewith, it is always in the graphite form. He adds, what, if true, is of great practical importance, that upon the condition of the silicium in any given sample of cast iron depends, in a very great degree, the practicability of converting that iron into steel by the Bessemer process. He regards diffused or uncombined silicium as the least injurious, stating that while iron containing as much as three or four per cent. of *free* silicium can be converted into excellent steel by the Bessemer method, the presence of a very much smaller quantity of *combined* silicium will either render the iron containing it incapable of being converted into steel by that method at all, or will cause the steel produced from such iron to be so hard and bad as to be quite incapable of being worked. He promises to publish shortly a full account of his method of determining the condition in which silicium exists in iron, with details of his experiments upon the influence of that condition upon the results of the iron by the process referred to.

The New York Society of Practical Engineering.

[Reported for the AMERICAN GAS-LIGHT JOURNAL.]

The above-named society held its regular fortnightly meeting at its room, No. 24 Cooper Union Building, Tuesday evening, Sept. 1st, James A. Whitney, President, in the chair.

Previous to taking up the subject of "Cleansing and Disinfecting the Streets of Cities," which formed the stated topic of the evening, Mr. Holms, M. E., presented to the Society samples of an alloy of gray cast-iron, very hard and sonorous, and adapted to the manufacture of bells of clear sharp tone, for locomotives and the like. The metal would also answer a good purpose in the making of dies, etc. Mr. Holms stated that superior bells of this material could be made at a price but little more than that of common castings.

A paper prepared by Dr. C. F. Jenny on the regular subject for discussion was read by the Corresponding Secretary, Joseph B. Lyman. In this paper the ground was taken that in order to insure the requisite sanitary state of city streets, the latter must be paved or floored on some plan that would prevent the soaking or percolation of liquids therethrough, to the end that no unhealthy exhalations might be generated by fœtid matter collecting under the pavement or in its interstices. The writer held that the pavement being made in this manner and the surface garbage removed by sweeping machines, the remainder or finer refuse could be readily and thoroughly removed by washing with water thrown in jets against it, by suitable means, the water flowing to the gutters after having done its work and thence to the sewers. He proposed the laying of pipes in the side or transverse streets, these pipes to be furnished with hydrants, from which water could be thrown upon the streets by hose, the water being taken from the rivers and forced through the pipes by steam engines. This plan would furnish any required quantity of water, without drawing upon the Croton. With reference to the structure of the pavement, it might be either of wood, stone or iron, but in addition to being substantially impenetrable to moisture, it should have a uniform surface, and must rest upon a substructure of such character that this surface may be maintained in spite of occasional disturbance, as in repairing gas and water mains, etc. The paper also treated with considerable fullness of different means of improving the sanitary condition of the streets by the use of disinfecting substances, and of other matters of collateral interest.

At the conclusion of Dr. Jenny's paper, a short one by Mr. Perry Dickson was read. Mr. Dickson suggested the use of a steam wagon carrying a water-reservoir and an apparatus for throwing the water upon the pavement in several jets, and at an angle that would dislodge the offal that may adhere to the surface after the removal of the coarser garbage. He maintained that such a machine could be moved faster or slower according as it might be necessary to use a greater or less quantity of water in cleansing any given portion of a street; and that by this method the cleansing operation would be so complete that no sprinkling to lay the dust in summer would be necessary.

The President stated that the plan of street-cleaning by jets thrown from hydrants was very old. It was tried in the city of Philadelphia many years ago with satisfactory results. The jets were also employed for washing the fronts of the houses. About a score of years since a similar method was tried in London, but was abandoned in favor of the "street orderly system" of sweeping and cleansing by the manual labor of gangs of laborers, which gave employment to the pauper labor of the city, and diminished the poor rates.

Dr. A. W. Hall.—An inventor in Washington has explained to me a novel mode of washing the streets. He proposes to make the lamp-posts serve as water pipes and to connect them by horizontal perforated tubes, so that by simply turning a stopcock water may be ejected therefrom to the middle of the street.

Dr. B. Franklin.—When garbage is carried into the sewers by washing the task of disinfecting the garbage is very great. Some means should be applied to disinfect the garbage before it passes to the sewers. Sulphate of iron is preferable as a disinfecting material to charcoal, which only absorbs the noxious gases.

Dr. Jenny.—I hardly thought it necessary in the paper to speak of the sewers—what will clean the streets will doubtless incidentally clean the sewers.

Prof. Wm. Robinson.—Charcoal seems to me to deserve more attention than it receives here. It absorbs very large quantities of gases, and prevents them from acting injuriously

The President.—No antiseptic is absolutely unlimited in its action. If that of charcoal is limited by its power of absorption, that of sulphate of iron and the like is bounded by its power of chemical combination.

Prof. Robinson.—The disinfection of streets depends some measure upon the motion of air in them. Great epidemics have often been immediately preceded by great calms. Fires made in the streets would induce motion in the air, and thus improve their sanitary condition.

A member remarked that it was an old practice to burn tar-barrels and similar materials in the streets of cities infected with yellow fever, and mentioned an example of the length of time that infectuous matter may retain its dangerous attributes. In London a few years since, a disorder broke out in consequence of the opening of some graves made in the time of the great plague two centuries before, and closely resembling the plague; this recalled an old tradition that the plague itself had resulted from the opening of an ancient burial ground that had remained intact from the time of the Saxon kings.

J. K. Fisher.—In the cleansing of streets the jet system was tested some years ago in Sheffield, Eng., with very satisfactory results. The water being estimated at the price charged to manufacturers, this mode of cleansing costs less than carting off the rubbish would. The best plan for cleaning streets is to use a steam machine that can be employed either for throwing jets on the pavements to clean them, or into burning buildings in case of fire. I proposed a plan some time since in which the water jets were to be followed up by a strong blast of air from the machine, which would expel the water from the crevices, and enable the pavement to dry rapidly. I think if the Croton water was properly distributed instead of being in a great measure wasted, it would be found sufficient to clean the streets.

J. B. Lyman.—The Croton supplies sixty-nine million gallons daily, nineteen millions are used in houses, and nine millions in manufacturing operations, the balance is wasted.

Lawrence Holms.—To return to the proper pavements of streets. I would mention a plan of my own, in which the pavement is made of iron, perforated in such a way as to afford a good foothold for draught animals, and also to permit the offal to fall through to a sub-pavement provided below and made of cement. By flushing the sub-pavement the offal would be swept through suitable conduit pipes to the sewers.

A gentleman present stated that several streets in St. Louis, Mo., were provided with a pavement closely resembling this. It cost in the neighborhood of three dollars and a half per square yard.

Among the miscellaneous business that followed the discussion, was a report of progress from the Committee on Water Meters, appointed at a previous meeting, and who announced that their investigation into the merits of different meters would be continued.

The society adjourned to meet again at the same place on Tuesday, the 15th inst., when "Elevated Railways for City Travel" will form the subject for discussion.

On Monochromatic Light.

BY HENRY MORTON, Ph.D.

The difficulty of producing monochromatic light in great quantity prevents us from demonstrating satisfactorily many points of interest in connection with the composition of light, and the theory of vision. Colored glasses placed in the path of powerful beams of white light are doubly unsatisfactory; they reduce the amount of light enormously, and with few exceptions (*e.g.*, red glass colored with gold) yield a beam of mixed color.

The old experiments of snap-dragon, or the spirit lamp with salted wick, are admirable as far as they go, but yield a very faint light at best. Something far superior to this is furnished by the arrangement of a ring of cotton wick wound on a wire, and supported immediately over and around a large Bunsen burner, the wick being soaked with an aqueous solution of some flame coloring salt. This plan in effect is suggested in Sir David Brewster's natural magic; but as the Bunsen burner was not then known, a less simple arrangement is described to perform the same office.

The drawbacks to this arrangement are: the trouble of adjusting the cotton wicks, the delay in changing to produce a new color, and the brief duration and, to a certain extent irregular amount of the effect.

After lighting, the burners increase their effect to a certain point, and then soon rapidly diminish in the intensity of their light.

When a large number of burners are to be used these difficulties become serious, and I have therefore devised the following arrangement, which has proved, on trial, thoroughly efficient:—The burners to be used, varying in number from 5 to 30, in different experiments, are enclosed below in a box with a single large entrance, opposite to which is placed an atomizer, operated either by steam or compressed air.

A spray of the coloring solution is thus mixed with the air supplying the burners, and their flames are thus tinged with the greatest ease, certainty, and intensity of effect, the whole action being entirely under control, and capable of being maintained indefinitely, while the change from one color to another is effected by simply transferring the tube of the atomizer from one solution to another.

For experiments demanding diffused light, this apparatus is most satisfactory. Five large Bunsen burners, thus arranged, light up the lecture room of the Franklin Institute, which seats about 350 persons; and with 60 burners, arranged in two groups of 30, I expect to illuminate sufficiently, at my next lecture, the Academy of Music, which has 3,500 stalls. Of course in neither case is the light brilliant, but sufficient to show in the most distant portions of the room the peculiar effects of this light on the faces and dresses of the audience themselves. Any object near the flame is, however, brightly illuminated.

The stage being set with the most brilliant scenery and colored decorations, suddenly illuminated by yellow light thus developed, the ordinary gas light being turned down, presents an appearance of ghastly change, which cannot be appreciated until seen, while sufficient light reaches all parts of the house to allow the audience to repeat the strange observation of metamorphosis upon their neighbors.

In certain experiments, however, it is necessary to have monochromatic light of great intensity and concentration.

This I have found could be furnished in the case of yellow light, to a certain extent, by substituting in the gas microscope or polariscope a soda-glass rod for the ordinary lime cylinder, and so adjusting its position that the rays from the heated glass should be cut off from the lenses, and only the light of the yellow flame should reach them.

We can thus show, upon a screen 5 feet in diameter, the greatly-increased number of rings developed by a section of iceland spar in monochromatic light.

With the spectroscope we can also project the sodium line on the screen, so as to be well seen by an audience of 500 persons. By afterwards producing the absorption-band due to the vapor of the substance, with the aid of a small Bunsen burner and iron spoon with sodium, and again showing the absorption-bands of nitric peroxide and of cochineal, the characteristic phenomena of spectrum analysis may be sufficiently illustrated, without the trouble and expense of the electric light.

We have, in fact, with a large and efficient battery at command, generally employed the above arrangement by preference.

The details of adjustment we will furnish, with pleasure, should any one think it of sufficient interest to ask for them.

A New Motive Power.

A practical demonstration was lately given at the College of the city of New York, of the working and power of a new electro-magnetic motor or engine invented by Lapan Clark Stuart. The experiments were made by Professor R. Ogden Doremus, in the presence of several scientific gentlemen, whose applause was frequently evoked. The new invention consists in the appliance of electricity to magnets, by which the motion is obtained; the magnets are fastened to a cylinder, which revolves when the electric wires are attached to it. With a galvanic battery of 40 cups, the engine is capable of making 500 revolutions a minute, equal to one-tenth of horse power; with larger magnets, but without any addition being made to the electric force, increased momentum is obtained. When 20 cups are used, as demonstrated yesterday, only 120 oscillations a minute are given to the cylinder; so that the greater the amount of electricity and size of the magnets, correspondingly greater becomes the acceleration. The cost of running an engine of this sort at two-horse power is estimated at $12 a day. Its salient features are claimed to be the continuity of the electric current, and the consequent continuity and steadiness of its movement, its cheapness and small size, and its saving of insurance. During his demonstration Prof. Doremus gave an illustration of the explosive qualities of nitro glycerine. He placed a quantity of the compound liquid in a capsule, and then impregnated it with galvanic heat, but until he touched the bottom of the vessel which contained it, it did not burn.—*Jour. of Mining, Aug* 15.

—A writer in the *Pittsburg Commercial* says that on the 1st of April last, the four principal petroleum ports of Europe had on hand a less stock than in the previous year by 95,193 barrels; the stock at New York and Philadelphia was less by 100,000 barrels; the stock at Pittsburg and the wells is less by 500,000 barrels, making a total falling off in the supply of 700,000 barrels. The production during the past year has averaged about 9,000 barrels per day, while the consumption is at least 13,000 barrels. Hence it is inferred that there will be a rise in oil.

Correspondence.

Correspondents in all cases should sign their communications with their names and address in full, not necessarily for publication, but as a guarantee of good faith.—EDS.

Taxes on Small Gas Works.

FITCHBURG, MASS., September 5th, 1868.

MESSRS. EDITORS: It gives me pleasure to learn by the article in your Journal of 2nd inst, that our brethren of the West are awakening to the injustice of the tax upon small Gas Companies. I send you the following circulars that were sent to the small Gas Companies in this State and others near us, with a copy of a petition sent to our members of Congress; but for want of a more general movement it failed of the effect desired. But I have such strong faith, from the justice of our case, that with a combined movement of all the small Companies, that the removal of the tax can be accomplished, that I trust the matter will not sleep until it is done.

I presented sworn statements from some nine Companies that they had not earned a dividend since 1861, to the Committee to which the petition was referred. I send the papers that you may send them to your correspondent, to show him we are with him.

Yours, H. F. COGGSHALL.

TREASURER'S & SUPERINTENDENT'S OFFICE,
FITCHBURG, Dec. 7th, 1867.

Dear Sir: While small gas companies pay a very heavy revenue tax to Government, and are too poor to pay any tax, large companies practically pay no tax, as their price per 1000 feet for gas was so low before the war they add the tax, while the price of small companies was so high before the tax was levied upon us, that we could not add the tax.

Now the object of this circular is to have a meeting in Boston, at the Parker House, Wednesday, December 18th, at 11 o'clock, A. M., to make a combined movement to have the tax abated. I think this can be done at the present time.

Does this movement meet with your approval, and if so, will you have your company represented at the above meeting. Respectfully, H. F. COGGSHALL.
Treas. and Sup't Fitchburg Gas Company.

SUPERINTENDENT'S OFFICE,
FITCHBURG, Dec. 24th, 1868.

Dear Sir: At a meeting of the representatives of some twenty gas companies, in Boston, the 18th inst, to see what measures could be taken to have the Government tax removed from small gas companies, the undersigned were chosen a committee to draw up such a petition to Congress as in their judgment might be thought best, and send the same to each gas company in New England whose consumption did not average 400,000 feet per month, for the signatures of the officers of their Company and such others in the place as would have an influence with the members of Congress from their District, and return the same to H. F. Coggshall, Fitchburg, Mass.

And also that all companies who have not paid a dividend since the advance in coal, etc., be requested to send to said Coggshall a transcript of their balance-sheet, which should be sworn to before a Notary Public Such statement to be used before the Committee on Ways and Means.

It is thought by the public at large, (and we do not except members of Congress) that gas companies are a monopoly, and make large dividends at the expense of the public.

Of the class of gas companies which we represent, we know this to be untrue, and we deem it very important that we have these facts to convince this committee of the truth of our statements. Facts sworn to they will believe.

By compliance with the above request at as early a day as possible, you will very much contribute towards carrying forward this movement, we trust, to the desired result.

As there will be small expense in bringing this matter to a successful issue, will your company bear your proportion of the same? Respectfully,

H. F. COGGSHALL,
Treas. & Sup't Fitchburg Gas Co.
HENRY J. ELLIOTT,
President Keene Gas Co.
GEORGE A. MERRILL,
President Rutland Gas Co.

[PETITION.]

TO THE HONORABLE SENATE AND HOUSE OF REPRESENTATIVES IN CONGRESS ASSEMBLED:

The undersigned respectfully represent that the revenue tax assessed upon small gas companies is a very severe and heavy burden upon us, and although, while our beloved country needed all the aid that could be given by all classes, and, although we could make no returns, in many cases, to those persons who had invested their capital in these enterprises, in dividends, we have paid this tax without a murmur or complaint.

And that you may understand that this is not an imaginary burden, but is such in fact, we would state that the tax assessed upon large companies, of 20 and 25 cts per thousand, is not paid by them, but by the consumers, for this reason, that the price they charged before the war was from $2 to $3 per 1000 feet, with the advance in price to meet the advance in materials, making the price not over $3 to $4, and to this price the companies add the tax.

Now it is well known that companies manufacturing 50,000 to 1,000,000 feet each 24 hours, can manufacture the same at a much less rate than 10,000 or 20,000 feet can be made. But small gas companies manufacture gas under a much greater disadvantage. Most of such companies are situated from 20 to 100 miles from the seaboard, and, consequently, have to pay from $1 to $4 per ton freight on their coal more than most of the large companies. They are situated in sparsely settled towns comparatively, having a longer length of main pipe in proportion to consumption, than large companies, and in consequence, a larger amount of capital in proportion to consumption, than large companies, and a larger per cent. of condensation and leakage in proportion to consumption, and in consequence of these disadvantages under which they labor, the price charged by all such companies was from $4 to $4.50 per 1000 feet, before the war, and very few were enabled to pay dividends, even at that price. The advance of materials that go into the cost of manufacture, in consequence of the war, such as coal 80 per cent, labor 90 per cent., iron 90 per cent., fire-brick 80 per cent., lime 90 per cent., could only be met by small companies by an advance of from 20 to 25 per cent at the most. This advance made the price so high that the tax could not be charged to the consumers without materially checking consumption, and as a consequence, the tax has, almost invariably, been paid by the gas companies. So that, practically, though large companies have paid no tax, it being paid by the consumers, while they have paid regular dividends, the small companies have borne the whole burden, and, in but few cases, have paid any dividends to their stockholders. Believing that it was the intention of Congress to tax no interest that could make no returns on its investments, and that your honorable body only wait to have such matters set before them in their true light, to promptly remove such burdens.

Now, believing that the condition of the country would not suffer from the removal of this burden, we humbly pray that the tax be entirely removed from all companies not using over 400,000 feet per month and to those using over 500,000 feet per month, it be reduced to 10 cents per thousand.

RAHWAY, September 7th, 1868.

MESSRS. EDITORS: We wish to co-operate in the movement for the removal of gas taxes from poor, small Gas Companies Companies that do not earn dividends for their stockholders should not be compelled to pay U. S. taxes. Yours, etc., J. R. SHOTWELL,
President Rahway Gas-Light Company.

Smedberg's "Synopsis of Gaslighting."

The following subscriptions to the above work are acknowledged, making in all 195.

William L. Williams, Sup't Paterson Gas Co., N. J.
F. J. Uhlrich, Sup't Galena Gas Company, Ill.
R. M. Wilder, Sup't Coldwater Gas Co., Mich.

Fodell's System of Bookkeeping.

The following subscriptions to "Fodell's System of Book-keeping for Gas-Light Companies" have been received, making in all 28:

Fredonia Natural Gas Company, Penn.
J. R. Shotwell, President Rahway Gas Co., N. J.
Henry Budd, Philadelphia, Penn.
John Horn, " "
E. G. Miller, " "

The Convention.

GALENA, ILL., Septomber 7th, 1868

MESSRS. EDITORS: * * * I should like to attend your Convention, but could not possibly spare the time so late in the Fall. I should prefer June or July as the time, and Cincinnati as the place.

Yours Respectfully, F. J. UHLRICH, Sup't.

COLDWATER, MICH., September 7th, 1868.

MESSRS. EDITORS: As to the proposed Convention, as between New York and Philadelphia, I would prefer the latter, but will try and attend at either place.

Yours truly, R. M. WILDER, Sup't.

General Summary.

SMEDBERG'S SYNOPSIS OF BRITISH GAS LIGHTING should be in the hands of every gas-engineer. Only five more names are sufficient to make the requisite number to insure its publication at an early day. So send your name to the AMERICAN GAS-LIGHT JOURNAL office, and confer a benefit on the gas fraternity.

EXHIBITION OF THE MARYLAND INSTITUTE.—The 21st annual exhibition of American manufactures and the mechanic arts, under the direction and superintendence of the Maryland Institute, will be opened at Baltimore, Md., on Tuesday evening, October 13th, and continue to Tuesday, November 10th. Information in regard to the regulations, or proper space required for the display of machinery, etc., may be obtained by application to Joseph Gibson, Esq., Actuary of the Institute, Baltimore, Md.

NEW FACILITIES FOR SHIPPING ANTHRACITE COAL ON LAKE ERIE.—The *Erie Dispatch* says: The Anthracite Coal Company's dock has at last got into working order, and the first cargo of coal shipped therefrom has been put on board ship. This is a success that Erie may be proud of, and it may not be unsafe to prognosticate a great increase in our coal shipments. This company has also obtained the privilege of receiving and shipping its dock coal and iron over the Philadelphia and Erie Railroad on the same terms as at their own dock in the harbor. This liberal arrangement will do much toward facilitating business.

THE SEWERAGE AND WATER SUPPLY OF GIBRALTAR.—The London *Builder* says the works of the main outfall are finished, and the house drainage is being begun. The works for conveying the water from the "Inundation" into the town are making rapid progress.—During the operation of driving a tunnel from the Landport ditch towards the Inundation, fresh water has been encountered in abundance soaking through from numerous springs. An estimate of the amount of these soakages, both in the tunnel and in another open cutting connected with the same works, has been made, and it is found to yield 1,436 gallons per hour. If it should prove that this stream is continuous, the great problem of the water supply of Gibraltar will be solved, and incalculable advantages must accrue to the whole community. All theories of the geological conditions of the Rock, according to the local *Chronicle*, seem to point to the existence of a large system of internal watershed.

SPECTRA OF FLAME.—Professor A. Lielegg has continued his researches on the spectra of the flame in which the melting is carried on according to the Bessemer system. This flame being only carbonic acid gas in an incandescent state, and the spectrum of this gas being yet unknown, the observations of M. Lielegg have served to fill up a gap in the series of spectra produced by the gases in combustion. The apparition and disappearance of some of the luminous fixed lines is closely connected with the metallurgical operations. At the moment when the decarburization of the iron is nearly terminated, these spectral lines assume essential modifications. The appearance of a group of lines and of an isolated line in the violet blue portion of the spectrum, marks a singular moment of the period during which the soft iron is being formed, and these lines disappear sooner than all the others; their appearance and disappearance serve, therefore, to indicate the termination of the process.

GAS COMPANIES AND STREET PAVEMENTS.—An English paper, the *Solicitors' Journal* says: "We think it may now be regarded as finally settled by the decision of Vice-Chancellor Malins, in Attorney-General *v.* Cambridge Gas Consumers' Company, that the breaking up of the streets of a town without parliamentary authority, for the purpose of laying down gas pipes, is such a public nuisance as will be restrained by injunction at the suit of the Attorney-General. The case is reported, 16 W. R. 1,007. Few, probably, of our readers—at any rate, of those who live in paved and lighted regions—will regret that the Vice-Chancellor should have arrived at this decision; yet, inasmuch as the full court came to a contrary conclusion in Attorney-General *v.* Sheffield Gas Company, 3 D. M. & G. 307, a case, in many respects, upon all fours with the Cambridge case, we do not wonder that the defendants in the latter case should have proceeded with so much confidence, and have expressed so much disappointment at the issue. Still the cases are distinguishable, and the state of public feeling has, no doubt, undergone a change with respect to the nuisance occasioned by gas companies disturbing the streets since the year of the Sheffield decision; and we take it, on the authority of Lord Cottenham, that the Court of Chancery, like every other institution, must accomodate itself to the demands of the age. We cannot, therefore, regret that another precedent has been established for the interference of the court with nuisances of this description."

The French Submarine "Davy" Lamp

Since the invention of the "Davy" lamp—which, although a wonderful discovery, gives but a faint light, and is not perfectly secure against the dangers of explosion by fire-damp—the English Government offered four thousand pounds as reward for the invention of a lamp burning without contact with the external air. Two young Parisian students of the Polytechnic school, MM. H. Lisuté and L. Denoyel, have carried off the prize. An oxygen lamp has been already constructed, but it could only burn under water by means of a supply of air pumped into it by machinery which required four men to work. The newly-invented lamp burns alone, carrying within it the requisite supply of gas. The *savans* denied that this could be done. A man, in costume of a diver, recently descended into the sluice opposite the Mint, to the depth of eight feet; the lamp burned beneath the water, and at the distance of two yards from him the diver was able to inscribe with a diamond on a piece of glass the date and hour of the experiment. The lamp burned for three quarters of an hour in the water, and when it was hauled to the surface it was still burning, and the flame as bright as ever. It has been made by M. Delenil, constructor to the Polytechnic school. Not only will this invention prevent the danger of explosions from fire-damp, but it will enable search for drowning persons, or for property lost by shipwreck, to be pursued with the utmost facility.—*Once a Week.*

Safety Valves for Steam Boilers.

We notice among the new American patents in the *American Artisan*, that H. W. Hewet, of New York, has patented an invention, the object of which is to produce a valve that will yield promptly when the pressure in the boiler exceeds that at which the valve is loaded, and will close as promptly the moment that excess has escaped; and it consists in applying the pressure of the steam to a portion only of the face of the valve through ports in its seat, in contradistinction to applying it to the center of the valve within the annular formation of the seat; the annular face of the valve may be either a convex or concave cone or both combined, that is, V-shaped in its cross section, the form of the seat corresponding with that of the face of the valve, which is annular, having a central as well as outer discharge; a channel or groove is formed in the center or thereabouts of the face of the valve of, say, a little more than one-third of the width thereof, and corresponding with this are ports in the seat communicating with the boiler; these ports are a little narrower than the groove which spans them, so that the steam pressing in said groove upwardly to lift the valve, reacts downwardly, on the uncovered portion of the seat, and opens the valve with great ease. The pressure-spring is accessible for adjustment when the steam is up, and is encased in a simple and convenient manner, so that it cannot be tampered with when adjusted and locked.

The Magnesium Light.

The light emitted by a magnesium wire one-thousandth of an inch in diameter is equal to that of seventy-four stearine candles of five to the pound; three feet of it are burned per minute, or a quarter of an ounce per hour, the cost of which, at the present price, would be about 2s. 6d. Seventy-four stearine candles would, however, in the same time consume 2 lbs. of stearine, which would cost 2s.; 40·4 cubic feet of twelve candles coal gas would be required to produce the same effect, and would cost about 2¾d. The dearness of magnesium arises from the dearness of sodium required in obtaining it. Magnesium gives off 265 times less heat than gas. Gas and candles vitiate the air by the production of watery vapor and carbonic acid; magnesium is free from this objection, but it has an inconvenience of its own: a large quantity of calcined magnesia is thrown off as a fine powder, which soon renders the atmosphere of a room intolerable. This is also objectionable in photography, though used for very short periods. At best magnesium can be only an imperfect substitute for sun-light, its light has been found to be only the 4·525th of that of the sun on a bright November day, but at the same time its chemical effect was ascertained to be the 1.36th of that of the sun.

—The atmosphere in the tunnels of the Metropolitan Railway in London is reported to be absolutely poisonous, and without any sufficient cause, as their proper ventilation is perfectly practicable. Several deaths are reported as having occurred in these neglected passages, and the compulsory purchase of the road by the government is loudly demanded by some of the English journals.

Gas Explosion at the United States Mint.

The Philadelphia *Ledger and Transcript* gives us the particulars of a very serious explosion of gas at the United States Mint in that city, which occurred on the morning of Monday, August 31st. The *Ledger* contains the following: "About 9 o'clock yesterday morning, an explosion of gas occurred in the fire-proof vault, attached to the room of the Chief Coiner of the Mint, at the northwest corner of Juniper and Chestnut streets, injuring severely Wm. Horner, the gas-fitter employed at the Mint, M. V. Davis, Clerk, and Andrew Stief, Assistant Clerk. The vault in which the explosion took place is some fifteen feet long, six or eight feet wide, and about fifteen feet high, having but one door of entrance, and no means of ventilation. There are two gas burners inside to give light to those employed in the vault, and it is supposed that when the light was turned off on Saturday, the flow of gas was not entirely stopped. When Messrs. Davis and Steif arrived at the office yesterday the smell of gas was exceedingly strong, particularly when the vault door was opened. Mr. Horner, who has charge of the entire gas fixtures in the Mint, was sent for, and on his entering the vault he lit a match by rubbing it against the wall inside; a terrific explosion instantly took place, throwing Mr. Horner through the vault door against a desk, at which Mr. Davis, the Coiner's clerk, was writing, and from this place he jumped or was blown out of the window on Juniper street, with his clothes all in a blaze. Workmen in the Mint soon reached the unfortunate man, and with their coats and blankets extinguished the flames, but not before his face, arms and body were badly, if not fatally, burned. The desk in the room was broken to pieces, and Mr. Davis, who was sitting, writing, was badly burned about the face and hands. The hair on his head was completely burned off. Mr. Stief was also burned about the hand and face. The two windows and the door leading into the room were completely shattered, together with the inside shutters. The ceiling of an adjoining vault, and the chimney flue, adjoining the vault where the explosion took place, were shattered, while a clock immediately above the door of the vault was not even stopped. The shelves in the vault were broken and the papers set on fire, and other articles knocked about in a general state of confusion; a mirror was undisturbed and escaped without a speck upon its bright surface. The Director of the Mint, Dr. R. H. Linderman, was sitting in his room immediately above, opening letters, and when the explosion took place he was lifted bodily from his chair nearly a foot.

Interesting Electrical Experiments.—M. Rondel of Brive, has recently been making some experiments which are described by the *Chemical News*: "If, while the current passes through the primary wire of a coil, one of the extremities of the secondary wire is brought near one of the extremities of the iron core, sparks can be drawn of remarkable intensity and brilliancy; if, at the same time, the other end of the secondary wire is put in communication with one of the poles of the pile, a great increase takes place in the brilliancy of the spark. Then, on touching with the hand the iron core, and placing the free end of the wire in contact with the skin, a smart stinging sensation is felt. The sparks were produced with detonations. A single Bunsen element of small size was sufficient to produce these phenomena. When two recipients are charged with mercury and water, and fragments of iodine added no effect is perceived; but if a small piece of zinc is allowed to fall into the mercury, the fragments of iodine are instantly set in motion and are rapidly dissolved. This solution, poured off clear, serves for many uses. M. Rondel has employed it, concentrated, for the supplying of a pile mounted in a closed flask, also for the preparation of a fine red iodide of mercury."

Notes for Machinists.—A correspondent of the *Scientific American* publishes the following, as things to be remembered by machinists:

Never turn a shaft without drilled centers.

Never turn the body until the ends are squared to the center and to the length.

Never allow a nut and bolt to pass that will not run down properly on each other.

Never pass a nut that does not screw down fair on its seat.

Never take the last cut on a thin casting, whether in the lathe or planer, without easing off the chuck or clamp that confines it.

Never use a tool square across the face to rough off with.

Never attempt to work steel that is harsh from want of proper annealing; better take it back to the smith and have it annealed properly, than waste time and tools in doing what will be only a poor job.

If you can buy good tools cheaper than you can make them, buy them.

PATENT CLAIMS.

Pertaining to Gas, Water, etc.

81,733.—Gas Burner.—Arthur Barbarin, New Orleans, La.

I claim, 1st. The method herein described of letting on the gas to the burner or shutting off therefrom, by the employment, in connection with the pipe or conduit for supplying gas to one or more burners, of a reservoir of quicksilver, glycerin, oils, or other non-freezing liquid in which the end of said conduit is immersed, the pressure of the gas in said conduit being regulated in the manner specified so that so long as the pressure does not exceed a certain limit, the gas will be retained in its conduit by the resistence of the said liquid, without the use of stopcocks or other means ordinarily employed, but whenever the pressure is increased so as to exceed the said limit, the gas will overcome the resistence of the liquid, and pass from its conduit to the burner, as set forth.

2d. The use and application, for the purpose specified in the preceding clause, of naphtha or other hydrocarbon liquid, substantially in the manner described, so that the said liquid shall not only constitute the stopcock of the conduit, but shall also carburet the gas when the latter is forced through it by the presence of the gas in said conduit.

3d. The combination, with a reservoir containing quicksilver or other suitable liquid, and carrying the gas burner, of the bent end of the gas induction pipe, held within the reservoir, and arranged as described, so as to be adjusted to a greater or less depth in the liquid in which it is immersed, the said liquid operating in connection with the pressure of gas in said pipe, to shut off and let on the gas to the burner, as set forth.

4th The combination, with a burner to which the flow of gas is regulated by means of quicksilver, oils, or other liquids, in connection with the pressure of gas in the conduit, as described, of a gas-lighting device, composed of spongy or finely-divided platinum, arranged above the orifice of the burner so as to be brought in contact with the gas issuing therefrom, as and for the purposes set forth.

81,734.—Self-Lighting Gas Burner.—Arthur Barbarin, New Orleans, La.

I claim a gas-lighting device, consisting of spongy or finely-divided platinum, combined with fine projecting platinum wire, and fine projecting wire points or ends in the manner herein specified, the said device being applied to a gas burner, and arranged to operate substantially as shown and set forth.

81,735.—Apparatus for Lighting Gas.—Arthur Barbarin, New Orleans, La.

I claim, 1st. The application and use of clockwork or equivalent mechanism, in combination with the armature of an electro-magnet, to let on or shut off the gas, and control at the same time the operation of the illuminating agent, substantially as described.

2d. The combination of the rotary valves for supplying gas to the burners, and the mechanism for operating and stopping the same, with the armature of an electro-magnet, under such an arrangement that the motion of the said armature towards its magnet shall leave the said valves free to revolve, substantially as set forth.

3d. The arrangement relatively to each other of the valves for supporting the hydrogen and illuminating gases to their respective burners, so that the hydrogen gas shall be supplied to its burners before the opening of the valve through which the illuminating gas passes, substantially as shown and described.

4th. The method of transmitting a current of electricity from a main battery to the magnets of one or more valve-operating apparatus, by means of an apparatus arranged and operating so as to effect the momentary closing of the circuit between the said battery and magnets, substantially as shown, and for the purpose described.

5th. The circuit-closing apparatus herein described, the same consisting of the combination of a revolving needle and its actuating and stopping mechanism, with the armature of the electro-magnet, the whole being constructed and arranged so that the momentary passage of a current of electricity through the said magnet shall so move its armature as to effect the revolution of the needle, substantially as set forth.

6th. The combination with the said circuit-closing needle, of a plate or disk, in and to which are secured the insulated wires of one or more apparatus for operating the valves which supply the gas to the burners, substantially as and for the purposes described.

7th. The method of closing the circuit of the local battery, by which the circuit-closing apparatus is actuated, by connecting the same with the operative works of a clock or other time piece, under the arrangements herein described, so that said circuit may closed at any desired hour.

8th. The construction and arrangement of the mechanism for closing and breaking the circuit between the operative works of the clock and the battery connected with the magnet of the circuit closing apparatus, substantially as shown and described.

9th. The combination, with the operative mechanism of a clock or other time piece, of the gas-lighting and circuit closing apparatus here described, the whole being constructed and arranged so as to cause the simultaneous ignition of any number of gas jets at any desired hour, substantially as set forth.

Metropolitan Drinking Fountain Association.—The annual meeting of the members and supporters of this useful association has been held in St. James's Hall. The chair was taken by the Hon. F. Byng. Mr. John Lee submitted the report from the committee. It expressed a hope that the generous support the association had hitherto received would not fail it until public free supplies of water for man and beast were placed in all the leading thoroughfares of the metropolis. The association had 117 fountains and 99 troughs under its care and supervision, and although they were spread over an area of something like 100 square miles, and were exposed to all the injury which thoughtless mischief, wilful malice, and unavoidable accident could inflict upon them, yet so efficiently had the supervision been carried out that at the present time there was not a single one out of repair. The total amount received during the year had been £3,649, but of that sum no less than £1,370 had been contributed for memorial fountains of special designs, and on special sites chosen by the donors. The report complained that in the establishment of cattle-troughs the society had not received that amount of support they had a right to expect from the Society for the Prevention of Cruelty to Animals, which had offered simply a sum of £10 for each trough, which was only equivalent to one year's maintenance. Eight fountains and thirty-five troughs had been erected during the year.—*London Builder.*

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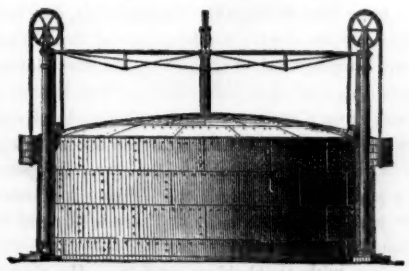

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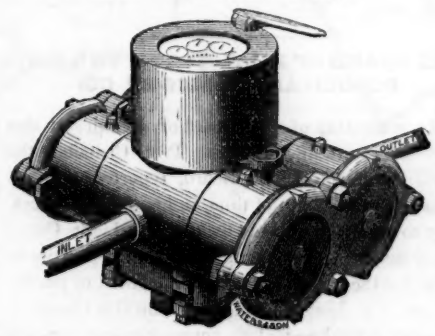

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WEDNESDAY, SEPTEMBER 16, 1868.

WISHING TO MAKE this Journal an organ of intelligent discussion to those of our readers who may wish to gain or give information on the subjects to which its columns are devoted, the publishers solicit letters from all among them who make the study of those subjects a pleasure, or a profession.

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Answers to Correspondents.

"OUT WEST" has been received and will appear in our next.

G. H. F., Ind.—Desires to learn where "Scholl's Platinum Gas Light Perfectors" may be obtained, and so do we.

M. S., N. Y.—Oxide of chronium is the best substance for polishing steel. The article is easily prepared by heating to redness the bi-chromate of potash. The neutral chromate of potash is formed while one equivalent of chromic acid is converted to chromic oxide, which is easily separated.

TYRO, N. Y.—Coke is the charcoal obtained by heating coal with the imperfect access of air, or by its distillation. The former is usually called *oven-coke*; the latter *gas coke*, being abundantly produced in gas works. "Choke-damp" is a term applied by well-diggers and miners to carbonic acid gas.

H. L. C., Phil.—For welding iron and steel a composition has lately been patented in Belgium, consisting of iron filings 1,000 parts; borax 500; balsam of copavi or some other resinous oil 50, sal ammoniac 75. They are mixed, heated and pulverized. The process of uniting the iron and steel is as usual. The parts are heated to a cherry red, covered with the preparation, brought together, again heated and welded.

W. A. B., N. C.—Copper and iron may be smelted together in almost all proportions, but it appears very doubtful whether any homogenous alloys can be produced. A small quantity of iron added to bronze or brass causes a considerable increase in tenacity. Malleable iron or steel containing copper to the extent of 1.45 or 0.5 per cent. shows symptoms of red shortness, which become decided with a larger quantity.

NEW METHOD FOR LIGHTING THE STREET LAMPS OF CITIES.

We learn that through the energy of Mr. Bartlett, the well-known sewing machine man of Broadway, that the London method of lighting our street lamps is being introduced in New York. The lamps on Madison Square are being lit after that method, and we doubt not that we shall soon see the same applied to all the street lamps in the city. The simplicity and ease with which the lighting is effected are its great recommendations. There is no need for the lamplighter to ascend the lamp-post, thereby dispensing with the ladder entirely. He simply carries in his hand an improved torch, which consists of a peculiar lamp inside of a tube fastened to a pole, which is thrust up into the lamp, the gas is turned on, and the flame immediately springs up. The turning on of the gas is effected by attaching a brass arm to the gas-tube, which is turned by the end of the torch as it is put in the lamp. This allows the gas to escape when it comes into contact with the flame inside of the torch tube, and ignition takes place. With this simple contrivance a man can light lamps twice as fast, and with a great deal more care, than by the old method. Mr. Bartlett studied the process in London, and procured a patent for the United States, which he now holds We trust soon to see this method introduced into all our great cities.

THE BOARD OF HEALTH AND THE METROPOLITAN GAS-LIGHT CO.

At a meeting of the Board of Health of this city, held on the 16th inst., Prof. Chandler, the anylitical chemist of the Board, reported with reference to the length of time, in his opinion, necessary to enable the Metropolitan Gas-Light Co. to complete the experiments which they propose to make for the improvement of the method of purifying gas. 1. That the officers of the Gas Company honestly intend to make a comprehensive series of experiments to determine how the gas can be completely purified, without causing annoyance to the public. 2. That important changes are now being made at the works, which makes this an unfavorable time for changing the method of purification. 3. That it would undoubtedly subject the officers of the Company to great inconvenience to be obliged to change their purifying process at once, without the opportunity to experiment. 4. That the nuisance of the present process is not a constant nuisance, but one which is experienced occasionally, when the purifiers are opened and the wind and weather permit the dissemination of the disagreeable odors through the city. It is not, therefore, a nuisance which must be checked at once to save life 5. That a peremptory order of the Board might place the city, between Thirty-fourth and Seventy-ninth streets, in darkness and thereby create a nuisance, which would be more keenly felt than that of the "dry-lime refuse." The Professor therefore recommended that a delay until March 1, 1869, be allowed the Company to complete their experiments.

The Board accepted the report, but limited the Company to December 1 next to finish the various tests, and abate the nuisance.

TAXES ON SMALL GAS-WORKS.

We have received, in answer to the request of a correspondent in our last, asking for co-operation in removing the excessive and unjust tax on small gas companies, a communication from H. F. Coggshall, Esq., of the Fitchburg (Mass.) Gas Light Company, which will be found in another column, accompanied with two circulars and a copy of a petition sent to Congress, which will demonstrate what has been done to accomplish the object mentioned.

Mr. Coggshall, in the letter adverted to, states that the movement failed on account of the want of combined action. Now, there is no good reason why a failure should occur in this particular instance; every small company should consult its own interest, and come forward *en masse* in support of the projectors of this movement, and we are certain that, should they do so, the removal of the tax can be obtained.

Any communications upon this subject which small companies and others interested in this matter may choose to favor us with, we will be happy to receive.

EDITORIAL ITEMS.

NOTICE.—Arrangements have been made to furnish to any one desiring them, any or all the books comprised in "Fodell's Book-keeping for Gas Companies," before the publication of the treatise The books will be ruled and printed ready for use, accompanied with directions. Application for the same may be made at this office.

GAS IN PORT CHESTER, N. Y.—The citizens of this place have had the pleasure of seeing the welcome rays thrown from the gas-lamps, illuminating the thoroughfare, and presenting an agreeable contrast with the past. A portion of Main-street was lighted for the first time on Saturday the 12 ult. The good people expressed their appreciation of the new state of affairs, and "there is rejoicing in the land."

DEATH OF A CHEMIST.—A dispatch announces that the well-known and eminent chemist, SCHONBEIN, has just died at Baden. He was 69 years of age, having been born at Mitzingen, in Wurtemburg, in 1799. His name is famous as the inventor of ozone and of gun-cotton.

WE have received a copy of a catalogue entitled the "Manufacturers', Commission Houses', and Importers' Catalogue," embracing advertisements of the principal manufacturers and importers in the States. This catalogue is intended for heavy wholesale buyers only. Among the advertisers we notice: Jos. Nason & Co., N. Y.; H. R. Worthington, N. Y.; Morris, Tasker & Co., Phila. and N. Y.; John Ashcroft, N. Y., Hoy, Kennedy & Co., N. Y., and a number of others.

☞ We direct the attention of our readers to the advertisement of the Union Gas Meter Works, on page 94, conducted by Messrs. Joseph Lennig & Co., where every description of gas apparatus and articles appertaining to gas works are manufactured. This firm having had long practical experience in this branch of business, is a guarantee that all orders entrusted to them will be executed in a workmanlike manner and give satisfaction.

ELECTRICAL LAMP-LIGHTER.—Messrs. Frank and E. E. Bean, of Boston, Mass., have on exhibition at No. 7 Doane-street in that city, a new invention for lighting the street lamps by electricity, which lets on and shuts off the gas, and at the same time does the lighting. With this small machine attached to the street lights and connected with the wires to the City Hall, one man can turn on the gas and light up the whole city in a few moments. An article descriptive of this invention was published on page 370, volume nine, of this Journal, under the caption "Lamplighters Superseded."

THE POLYTECHNIC INSTITUTE, BROOKLYN.—The thirteenth annual catalogue of the officers and students of the Brooklyn Collegiate and Polytechnic

Institute has been laid on our table. This institution was incorporated in April, 1854, and first opened for students in September, 1855. Its object, as stated in the pamphlet, is to afford to the youth of that city and others who may choose it as a place of study, the requisite facilities for a thorough education, adapted to their destined pursuits. A large and commodious edifice, erected for its use, is provided with all necessary means for the comfort and health of its pupils. The library connected with the Institute numbers nearly three thousand volumes, and is steadily increasing.

THE VALLEY COAL COMPANY.—We learn from the Ironton *Republican* that the personal property of this company was sold by the Sheriff on the 27th July, under an execution in favor of the holders of the unpaid coupons on their bonded debt. It was purchased for a song in the interest of the bondholders, of which the Lehigh Coal and Navigation Company is the principal one. This foreshadows the destiny of this Company's property. Its real estate, comprising about 1,000 acres in Newport township, with its extensive and valuable improvements, were to be sold on the 16th ult. on a writ in favor of H. B. Wright and other trustees for the bondholders, which will wipe out all the stock, and the Valley Coal Company, with its thousand acres, will fall into the hands of the Lehigh Coal and Navigation Company.

MERCANTILE LIBRARY.—The forty-ninth annual report of this institution has been placed before us, and from a cursory glance at its contents, we take pleasure in congratulating its members upon the prosperous condition of the association. It has attained a position of usefulness and prosperity which must surprise its early supporters, and is increasing year by year, which will place it in the front rank of the libraries on this continent in the number and value of its volumes, and the influence it exerts in this great centre of commerce. In 1862 there were 4,085 active members and 65,751 volumes, and to day, after a lapse of but five years, they have 10,718 active members, and 95,673 volumes. The reading rooms present to the young a pleasant home in winter and in summer, where their evenings can be spent in consulting with the great minds of the past and present, laying up in youth a store of knowledge more to be desired than gold.

THE SOUTH AMERICAN EARTHQUAKE.—The recent appalling news from South America, of the terrible loss of life and property by an earthquake the effect of which was felt thousands of miles distant from the place of its first demonstration, goes to show the utter insignificance of man when the Supreme power is at work. Twenty cities and over thirty thousand souls blotted out one afternoon last month in less time than it takes to relate the dreadful fact! How small and contemptible do the calculations, changes and convulsions of human government appear in the presence of those mysterious agencies that lie beneath the earth's surface! The late convulsions of nature at St. Thomas, Alaska and the Sandwich Islands pale before the terrors of this South American calamity. It must be classed among the most direful visitations ever experienced in the world.

These occurrences, however, are not confined to any particular quarter of the globe. The great earthquakes of Lisbon and Naples, in Europe; the earthquakes which have visited New Madrid and the Mississippi Valley, in 1811, and the numerous and destructive earthquakes which have taken place in Asia and Africa, show that there is scarcely a point on this "ant hill of ours" which may claim immunity from these frightful visitations.

THE LYCOMING GAS AND WATER COMPANY'S NEW MAIN.

A subscribers sends us the following interesting particulars, taken from the *Lycoming Gazette*, of Williamsport, Pa., of the laying of a new water main for the Lycoming Gas and Water Company, which will be interesting to a large number of the readers of the Journal:

"There is now being laid across the Susquehanna river, at the upper part of our city, a large size cast-iron water main for the Lycoming Gas and Water Company, which is intended for supplying the upper part of our growing city; the operation of laying this pipe is really very interesting and wonderful, showing how science can be made to assist mechanics. The pipes they are laying weigh about three-quarters of a ton each, the pipes are lowered into the water and then connected by the submarine diver, Mr. Joseph C. Atwood, and his assistant, Mr. James Hughes, who appear to suffer no inconvenience, and who are able to work under the water (which is from seven to twelve feet in depth), as those who are assisting them on the scows above. The joint they are using is known as the Robbins patent joint, and is made of lead, and cast into the bell of each pipe, (that, however, is done at the foundry), in which there is a groove which holds the lead and prevents it being forced out by the pressure of the spigot end of the pipe. The pipes are forced together with a hydraulic jack, the one now used being of thirty tons power, with this style of joint it only takes about twenty minutes to put together a pipe after it reaches the bottom of the river. Considerable numbers of our citizens, including those connected with the water and gas companies of this city, visited the scows where the pipes are being laid, and have expressed themselves as being entirely satisfied with the advantages and economy of this kind of joint over the ordinary lead joint; particularly as it can be laid in the water at any depth, and that too at a much less cost compared with any other mode of laying pipe. We are indebted to Mr. John P. Townsend, of New York, and Mr. Robt. C. Hicks, of Philadelphia, who have been entrusted by the West Jersey Foundry Company, of Camden, New Jersey, with this important undertaking. The pipes were all made by the New Jersey Foundry Co., who also contracted for the laying of them through the river. They are the owners of the right to make and sell the Robbins patent joint. This undertaking having been so very successful, (it being the first time that pipe has been put together under the water this way of this size), we have no doubt but that the West Jersey Foundry will find it difficult to execute orders for this kind of work.

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AND

CLAY RETORT WORKS.

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Manufacture and Distribution of

COAL GAS,

Its Introduction and Progressive Improvement, Illustrated by

Engravings from Working Drawings,

With General Estimates by

SAMUEL CLEGG, Jr.

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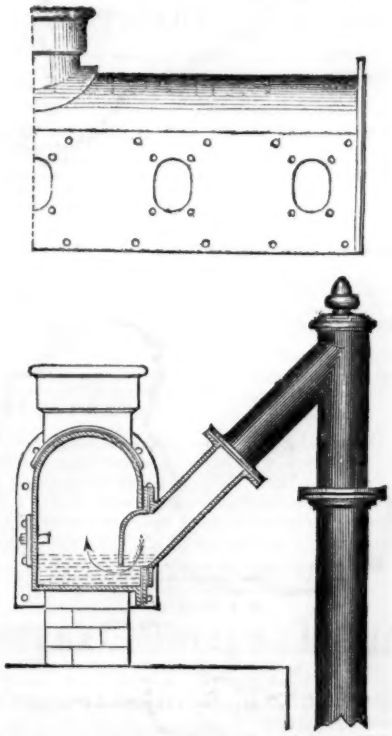

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By the removal of the front plate only the Main can be adopted to Settings of any number of Retorts desired. The Patent Main can be applied to the ordinary D shaped Main. It offers great facilities for cleaning, and is not liable to stoppage.

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REFERS TO—J. A. Sabattan, Esq., Engineer Manhattan Gas Co—Col. A J. White, Metropolitan Gas Co.—C. C. Mowten, Engineer New-York Gas-light Co.—J. Mowten Saunders, Engineer Baltimore Gas Co.—John T. Harrison, Engineer Savannah Gas Co.

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No odor, no dirt, no soot, no ashes, no coal box, no punching and renewing fires.

THE CAMBRIDGE GAS STOVE.

This truly scientific invention received the premium at the State Fair at St. Louis, and is being introduced at the West, and also in the New England States with great success. Certificates of its excellence and superiority from some of our most scientific and influential men have been voluntarily given, and will be furnished upon application.

These stoves may be seen in operation at Messrs. Bliss & Co., 95 Bleecker street, or at No. 22 Pine street, Room 10, where information may be obtained.

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THE MOST PERFECT CONNECTION FOR STREET MAINS.

ROBBINS' PATENT JOINT.

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WEST JERSEY FOUNDRY,

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EXTRACTS FROM TESTIMONIALS.

These pipes can be laid with much greater facility than the common joint, are tighter when laid, and more secure against any disturbance of the joint by action of time or other causes.
In my judgement, the Robbins Joint is superior to any mode yet presented for connecting gas mains. H. J. MILLER, Cincinnati Gas Company.

After using it extensively, and testing it thoroughly, I am fully persuaded that, as a connection for street mains, the "Robbins Joint" has no equal.
Its superiority consists of facility in laying, economy in time and lead, and, above all, its perfection as a Joint, thus saving largely in leakage. H. STACEY, Superintendent Indianapolis Gas Co.

We are entirely satisfied with the "Robbins' Patent Joint" for connecting our street mains. R. SALTER, Superintendent, Covington Gas Company.

All the pipe laid have been tested by hydraulic pressure, and carefully put down, mostly, with the Robbins Patent Joint.
Experiment has fully demonstrated that said joint is entirely reliable, infinitely superior, and more economical than any other we have seen.—Annual Report of Sup't Cincinnati Water Works.

The experiment of laying the first lot of patent pipe has been concluded to my satisfaction. Your pipe layer laid 1200 feet in ten hours, notwithstanding numerous obstructions, such as rain, mud and water in the trenches, curves and crossings at intersections. E. W. BAILEY, Sup't Evansville Gas Company.

The quantity of Gas saved by using Robbins' Joint for street mains is of the utmost importance to gas companies.
R. T. COVERDALE, Gas Engineer.

As there is always a large difference between the quantity of gas made at the works, and the quantity for which the Company receives pay, any improvement that will reduce that loss must be very important to owners of Gas Works. We claim this desideratum for the "ROBBINS' JOINT."
The Manufacturers will contract with Water and Gas Companies to lay the Pipe in the trench, even under water, and guarantee the Joint to be absolutely tight.

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☞ *Reference to the AM. GAS-LIGHT JOURNAL.* (205

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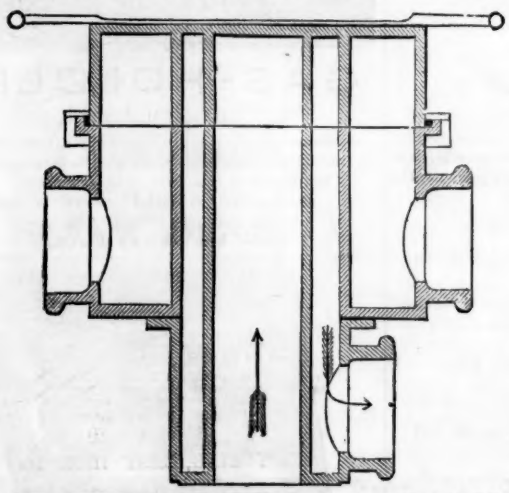

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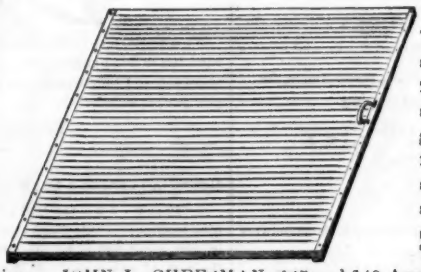

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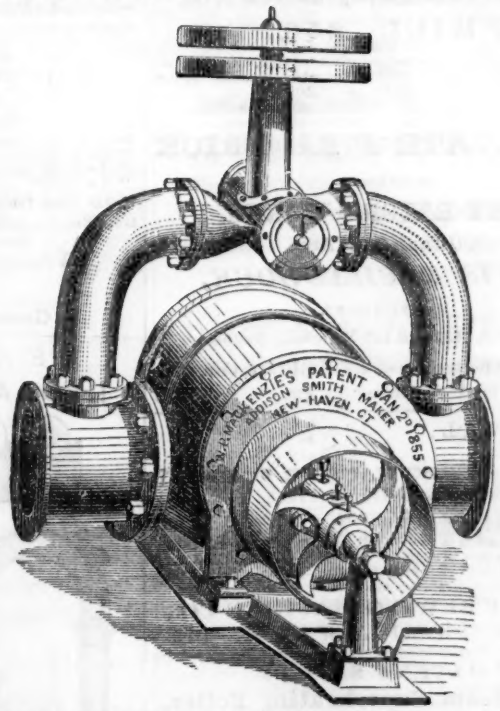

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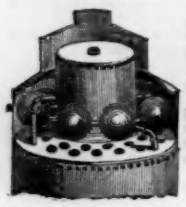

Requires only 25 lbs. of coal per day to the horse-power. Are made of the VERY BEST IRON, double lapped and double riveted.

Being upright, occupy little space, and are easily cleaned.

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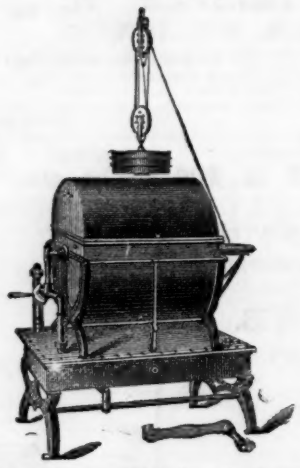
For Lighting Private Dwellings, Churches, Hotels, and Factories in any locality, and independent of any Gas Company.



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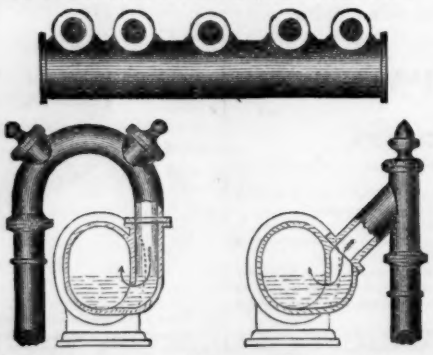

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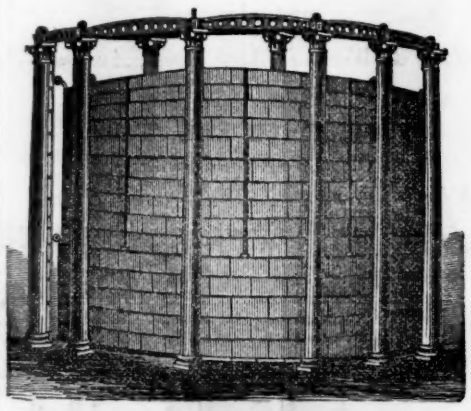

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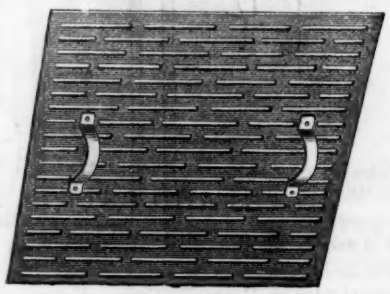

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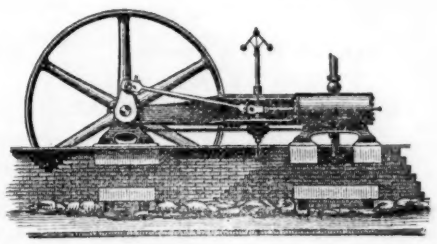

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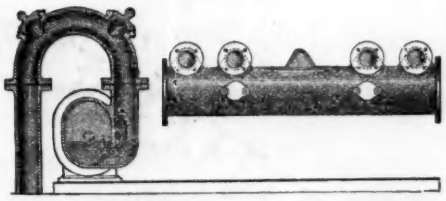

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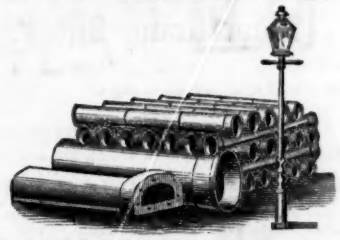

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The following are some of its most valuable features:

1st. Owing to the peculiar nature of admitting the air into the furnace, steam will be more rapidly generated, and more easily kept to the desired pressure.

2d. By the remarkable construction of the air channels in the upper portion of the bar, a transverse circulation is produced, which so regularly diffuses the air throughout the furnace that little or no clinker is formed, even with the worst qualities of coal; and what little may at times be produced, does not adhere to the surface of the bar.

3rd. The air passing over the bridge below the coal surface, keeps the lower part of the bar comparatively

cool and prevents warping—expansion and contraction being entirely confined to the subdivisions of the upper part of the bar. Thus the heated sections can readily expand over the bridges in the air channels, which are placed below the surface, principally for that purpose. This bar can be as easily raked, sliced, or removed, as the old-fashioned straight bar; and neither will require to be done so often, and can be put into any common furnace without alteration.

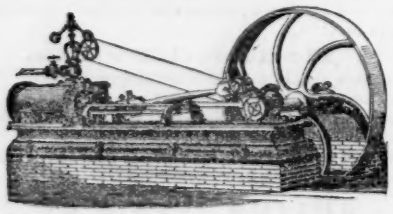
4th. It is lighter than the ordinary bar; yet owing to the manner in which it is protected against the action of the heat, it is more durable. It will wear longer in use than any other, thus effecting a saving in the cost of bars. It is also more easily worked, and less liable to get out of order.

5th. Owing to the more perfect combustion of the fuel used, produced by the greater quantity of air admitted to the furnace, a considerable saving is effected.

For further information apply to Messrs. Hutchinson & Lawrence, 8 Dey street, N. Y., agents.

Horizontal Engine.

The first and most important consideration which presents itself to a person who designs erecting a mill, is the motive power. Upon this being right depends the successful and profitable working of the whole thing. There are so many opinions on this subject, that it is difficult for any one not thoroughly acquainted with it to determine what he really wants, and he is apt to go for information to some one whose experi-



ence extends over but one mill, and taking his suggestions incorporate them into his inquiries for mills. Such information, though very good perhaps as far as it goes, is necessarily very limited, and does not always prove satisfactory.

There are two points regarding engines for saw mills, no matter how diverse opinions may be on other matters, on which all will agree, and these are simplicity of construction and strength. The fewer parts there are about an engine to get out of order the better. There will be less friction and wear and tear, less oil expended, and less trouble to the engineer. Besides it can be understood by an ordinary man, who will learn to run it more easily and quickly.

It has been the great aim of the inventor to embody this feature in their engines; to divest them of all superfluous ornament and give greater care and attention to the vital or working parts.

The bed plate is cast solid in one piece, and is formed of large mouldings which so dispose of the iron as to give great stiffness and strength.

The cylinder is made of sterling iron, and has a true and even bore.

The slides on the smaller engines are made of wrought iron as shown in the accompanying cut. In the larger engines are used a cross head with brass gibs which can be taken up as they wear away by use.

The connecting rod is of wrought iron, and of good length, and has strap ends with gibs and keys to bring the boxes together.

The pillaw blocks are lined with anti-friction metal.

The crank shaft is of wrought iron and large diameter.

The fly wheel is cast solid and turned even and true on its face for a band, which prevents great wear and slipping of belts.

The heater is so arranged with pipes that if any part is injured it can be repaired very easily; during the repairing of which the pump can be so disconnected as to pump directly into the boiler without passing through the heatre.

The feed pump is driven by a band from the main shaft of the engine, and can be run on or off at pleasure.

The governor is either a "Judson" or a "Pickering" make. The reputation of both these governars is well established. It is sufficient to say that they will control the engine under every possible variation of speed.

These engines are manufactured by the Albertson & Douglass Machine Company, New London, Connecticut. Messrs. Hutchinson & Lawrence, 8 Dey street, N. Y. City, are agents.

Advertising Index.

☞ In looking for advertisements, see figures 1 to 9, within brackets, at head of advertisement pages.

GAS-BURNERS, APPARATUS ETC.

Arnold's Metallic Gas Trays—T. G. Arnold, 334 and 336 West 21st street, N. Y. 6
American Meter Company, 512 West 22d street, New York 8
Automatic Gas Purifier—State Rights for sale—Wm. C. Turnbull, care of T. C. Babcock, 59 Broadway, or office of the American Gas-Light Journal 2
Builder of Gas Works, Apparatus, Etc.—P. P. Delly, 39 Laurel street, Philadelphia 6
Contractors for Gas-works, Etc.—Murray, Baker & Walker, Fort Wayne, Ind 2
Cambridge Gas Stoves, Ranges, &c.—Gas Light Journal Offices, 3
Gas Coals—Bird, Perkins & Job, 104 Wall street, New York 4
Gas Engineers and Contractors—Hoy, Kennedy & Co., 111 Liberty street, New York 4
Gas-Burners—C. Gefrorer, 529 Commerce street, Philadelphia, Pa 9
Gas Meter Manufacturers—Harris & Bro., 1117 Cherry street, Philadelphia, Pa 8
Gas Superintendent—C. M. Cresson, 417 Walnut st., Phila., Pa 9
Gas Apparatus, &c.—Geo. H. Kitchen & Co., 561 Broadway 9
Gas Burners—Wightman Bros., 25 Kilby st., Boston, Mass 9
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WATER METERS, PUMPS, ETC.

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J. S. Phillips, Mining Engineer, Wadsworth House, San Francisco, Cal. 4

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Prince's Metallic Paint—D. Sloan & Co. 115 Liberty street. 5
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Smedberg's "Synopsis of Gas-Lighting" 2
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Treatise on the Manufacture of Gas—D. Van Nostrand, 192 Broadway, New York 8
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Works on the Manufacture of Gas—D. Van Nostrand, 192 Broadway, New York 2

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